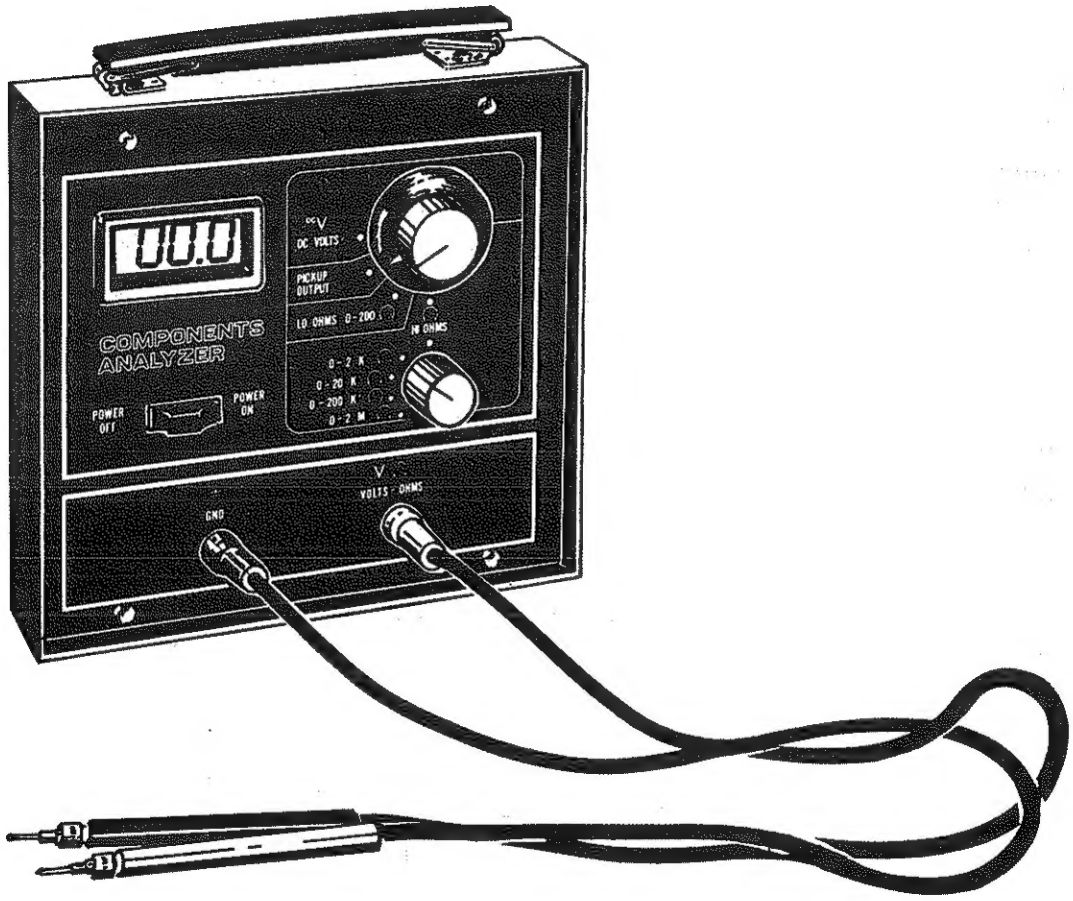
2891

INSTRUCTIONS FOR

Components Analyzer



98-8589

WARNING!

IMPORTANT OPERATING & SAFETY NOTES ... READ BEFORE PROCEEDING WITH TESTS

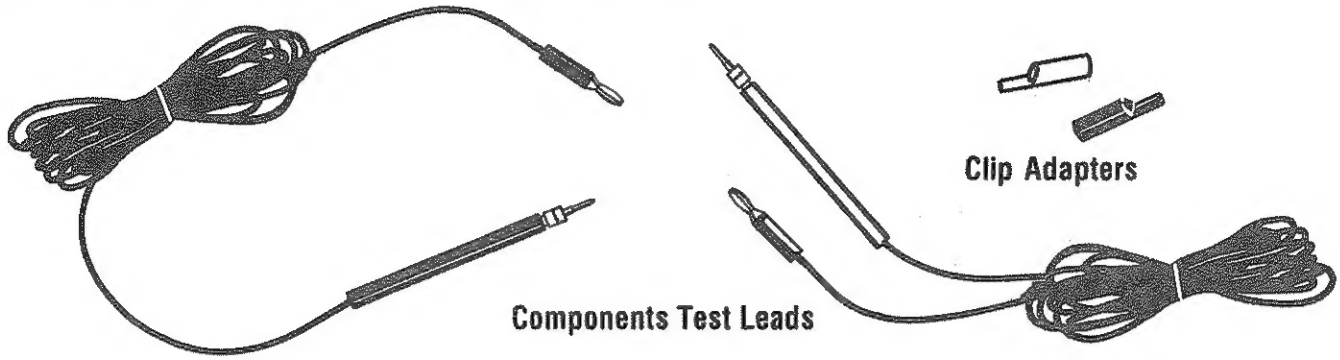
1. **Always** work in a well ventilated area ... **Never** start a vehicle's engine in an enclosed area.
2. **Never** smoke or allow any other open flame to come within 25 feet of the vehicle being tested.
3. **Always** insure that **everyone** within close proximity of the vehicle being tested is **correctly** wearing approved safety/protective glasses before proceeding with any testing or adjustments.
4. **Always** insure that the vehicle's engine is turned **OFF** when connecting or disconnecting any and all test equipment.
5. **Never** stand in front of the vehicle while testing.
6. **Always** insure that the tester's black grounding clip is connected **first** during hook-up and that it is disconnected **last** when testing is completed.
7. **Always** exercise **extreme** caution to insure that hands, arms, clothing and tester leads are kept well away from **ALL** moving engine parts.
8. Because the battery may produce highly explosive gases, it is extremely important that you carefully observe the following precautions:
   A. **DO NOT** smoke or allow any other open flame or spark within 25 feet of the battery.
   B. **NEVER DIRECTLY CONNECT THE POSITIVE AND NEGATIVE** battery post together with any single conductive material (such as a screwdriver, jumper lead, etc.), as this will cause a short circuit and spark which could result in an explosion.
9. Battery acid and corrosion can be extremely dangerous and **MUST BE DEALT WITH VERY CAREFULLY.**
   A. **DO NOT** allow battery acid or corrosion to come in direct contact with skin or eyes ... If it does, thoroughly wash skin with warm, soapy water **IMMEDIATELY** and/or rinse eyes with clear water for 15-20 minutes ... **CONTACT PHYSICIAN IMMEDIATELY.**
   B. Extreme caution must be exercised to avoid ingestion of battery acid or corrosion ... If ingestion does occur, drink large quantities of milk **(DO NOT INDUCE VOMITING). CONTACT PHYSICIAN IMMEDIATELY.**
10. Tremendous back pressure can be developed in the radiator, and taking the radiator cap off improperly can result in a sudden release of scalding hot water, and subsequent serious burns. You **MUST** refer to proper vehicle manufacturer's service manual for correct procedure.

Due to the inherent dangers associated with even the simplest automotive maintenance procedures, the manufacturer and all parties involved in the distribution and/or sale of this automotive test product will NOT be held liable or responsible, wholly OR partially, for ANY injuries, damages or claims resulting from the performance of testing or adjustment procedures included in this instruction guide and/or the use of this automotive test product.

CONTENTS

FEATURES AND BENEFITS

The Components Analyzer is a very accurate high impedence digital Volt-Ohm meter. It can measure DC Volts (0-20V DC), pickup coil output, and five ranges of resistance. The Low Ohms scale can be used for checking diodes and will measure down to tenths of an ohm. The D.C. volts scale will read hundredths of a volt and has 10 Megohm input impedence.
Extra long (six feet) red and black test leads are provided with the analyzer, along with slide-on clip adapters for easy hook-up and "hands free" operation.



PERFORMANCE SPECIFICATIONS			
TEST	SELECTOR POSITION	SCALE[S]	APPLICATION
D.C. Voltage	D.C. Volts	0-19.99V D.C.	D.C. Voltage measurement
Pickup Coil	Pickup Output	0-19.9 V P-P	P-P Voltage output of Pickup coil
Resistance	Lo Ohms	0-199.9	Low resistance, Diode check
	Hi Ohms	0-1.999K 0-19.99K 0-199.9K 0-1.999M	High resistance measurements

GENERAL INFORMATION

LIQUID CRYSTAL DISPLAY

The components analyzer uses a digital display to present the measurements taken during testing. The measurements are in numeric form, and combine the advantages of improved readability with greater accuracy. There are two special indications that may appear during normal operation. See figure 1.

1. A reading of "1" in the left digit of the display indicates infinite(∞)resistance or an overrange reading.

2. A LO BAT or an arrow in the upper left corner of the display will appear as an indication that one of the 9 volt analyzer batteries is weak. The battery should be replaced. Refer to the maintenance section for battery replacement.

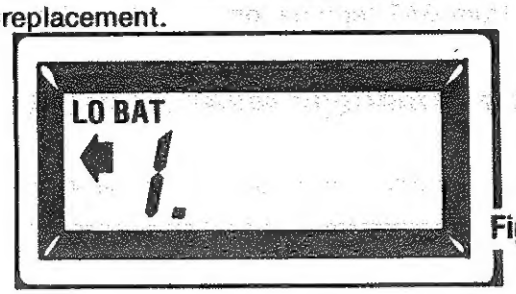


Figure 1.

Temperature, either too cold or too hot may affect the Liquid Crystal Display indications. During prolonged use at temperatures below 32° F the display may freeze at a given reading. This condition should not result in permanent damage. During prolonged use at 140° or higher, the Liquid Crystal Display may go into solution and appear black. This condition also should not result in permanent damage.

STANDARD CONVERSIONS

.01 Volts	=	10mV (millivolts)
.1 Volts	=	100mV (millivolts)
1000Ω (Ohms)	=	1KΩ (Kilohms)
1000KΩ (Kilohms)	=	1MΩ (Megohms)

MANUFACTURER'S SPECIFICATIONS

In performing the tests described in this manual, it is important to follow mahufacturer's specifications for the test vehicle whenever possible. These specifications can be found in the vehicle manufacturer's service manual.

DISABLING ELECTRONIC IGNITION SYSTEMS

When performing many of the tests on electronic ignition systems, the ignition system must be disabled to prevent the engine from starting. On the GM High Energy Ignition (HEI) systems, a wire at the distributor must be disconnected. On the other American made systems, a module must be disconnected. The various methods for disabling electronic ignition systems are as follows:

4 cyl. and in-line 6 cyl. HEI

Remove cover from ignition coil and detach battery primary lead as shown in figure 2.

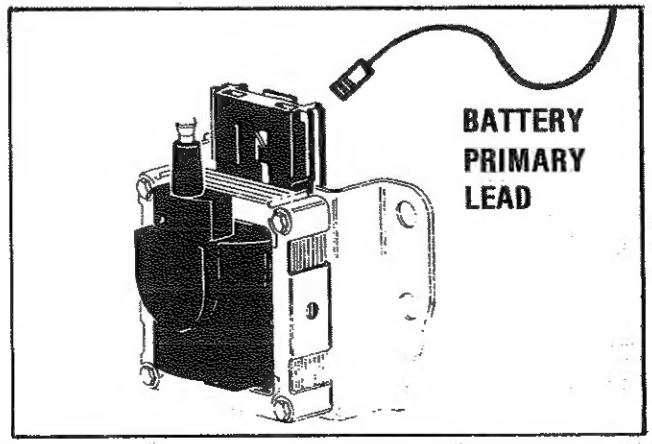


Figure 2. Disabling 4- and In-Line 6-Cylinder HEI Systems.

GENERAL INFORMATION

V-6 and V-8 HEI

Disconnect primary wire from BAT terminal on distributor cap as shown in figure 3.

Other American Made Systems

Disconnect the module as shown in figures 4, 5 and 6.

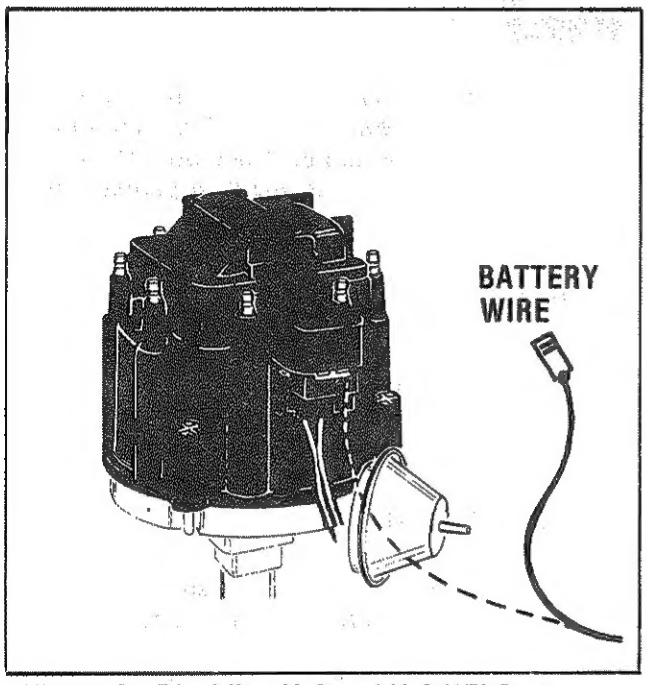


Figure 3. Disabling V-6 and V-8 HEI Systems.

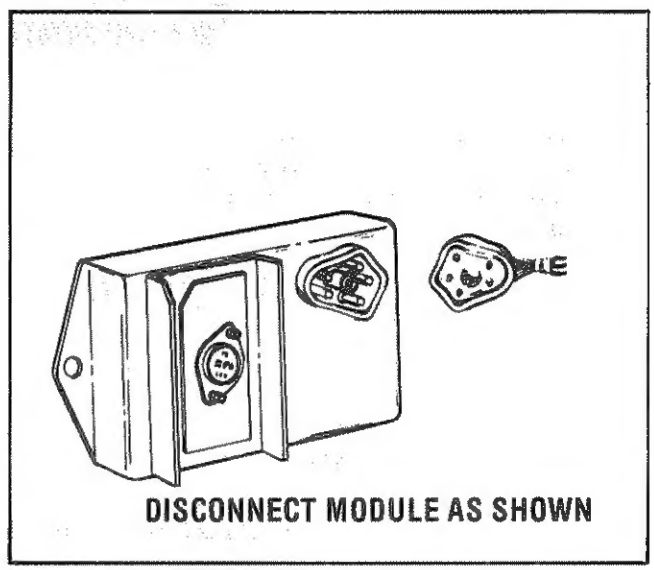


Figure 4. Disabling Chrysler Electronics Ignition.

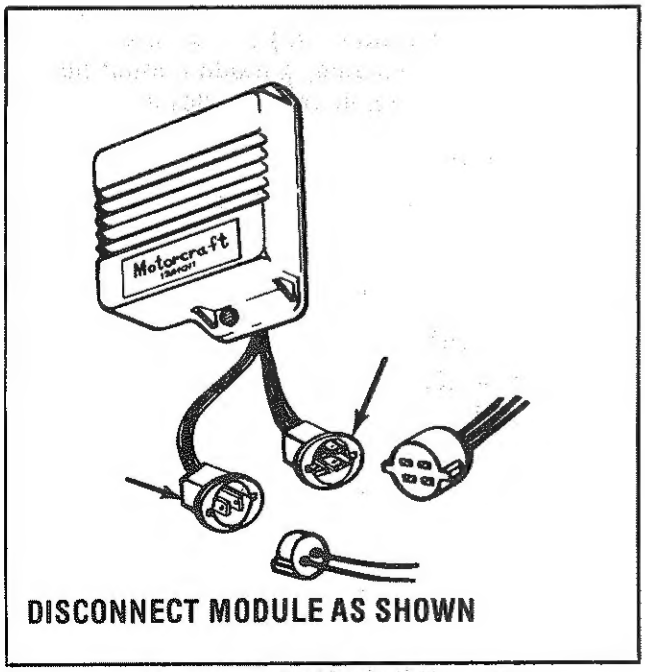


Figure 5. Disabling Ford Electronic Ignition.

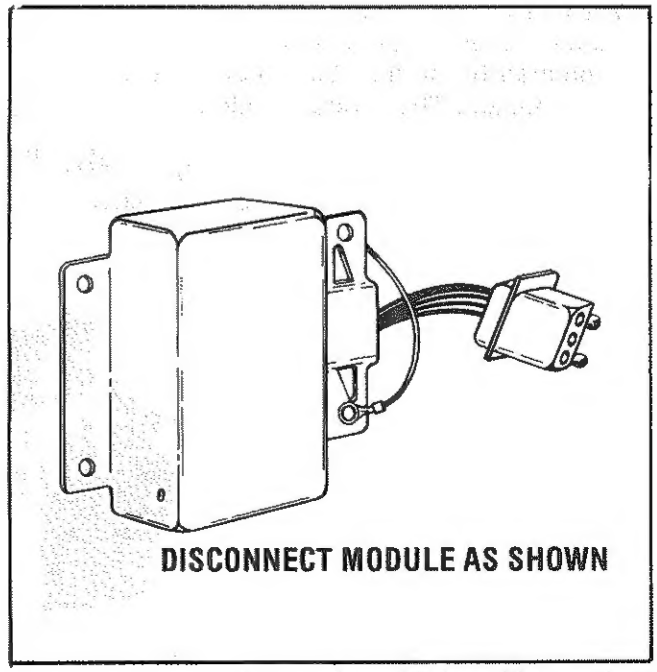


Figure 6. Disabling American Motors Electronic Ignition.

COMPONENT AND CIRCUIT TESTING

ANALYZER VOLTAGE TESTS

Voltage tests are performed as described below using the Red and Black test probes with the Selector Knob in the DC VOLTS position. No other test lead connections or knob adjustments are necessary.

Fuse Test

1. Switch Analyzer to POWER ON.
2. Rotate Test Select Switch to DC Volts.
3. Turn test vehicle ignition switch ON.
4. Touch black test probe to a ground on the engine or car frame (figure 7).
5. Touch both ends of the fuse to be tested, in turn, with the red test probe.
6. Read volts.

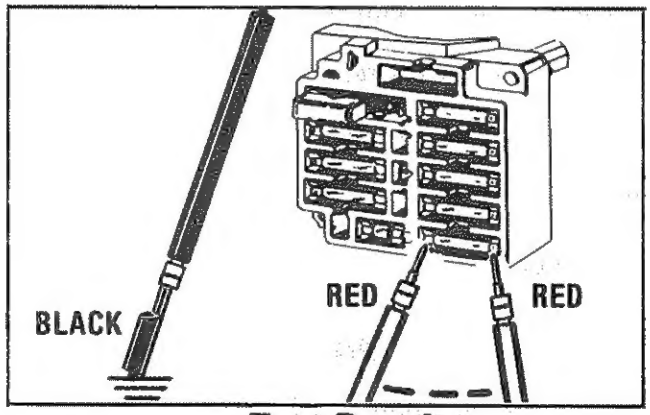


Figure 7. Fuse Testing.

Test Results

a. Nominal battery voltage (approximately 12 volts) on one side of the fuse and zero on the other side indicates an open DEFECTIVE fuse, which must be replaced.

b. Nominal battery voltage present on both sides of the fuse indicates a GOOD fuse.

Primary Ignition Voltage Test

Excessive voltage loss in the primary circuit between the vehicle's battery and the ignition coil can reduce coil output to the extent that hard starting and poor performance can result. This test is used to detect excessive voltage loss in the primary wiring.

Note

This test does not apply to the General Motors High Energy Ignition, the American Motors BID ignition, the Ford Dura Spark 1 ignition, or any other ignition system without a ballast resistor in the primary ignition circuit.

1. Switch Analyzer to POWER ON.
2. Rotate Test Select Knob to DC VOLTS.
3. Connect Red test clip to positive (+) battery terminal and Black test clip to positive(+) coil terminal, as illustrated in figure 8. Connect a Jumper Wire between negative (—) coil terminal

and a good ground on the engine.

4. Turn ignition switch ON and read volts.

Test Results

Low

If reading is below 4.5 volts, check for defective or incorrect ballast resistor or resistance wire in the primary circuit. If reading is "0" or near "0", the primary resistor is shorted (or is located within the coil).

Good

Reading should be between 4.5 and 7.5 volts.

High

A reading above 7.5 volts indicates high circuit resistance. Check for:

1. Defective ballast resistor or resistance wire.
2. Loose or corroded primary circuit connections.
3. Defective ignition switch.
4. Defective neutral safety switch.

Note

On a 6-volt system, a reading above 1 volt indicates high circuit resistance.

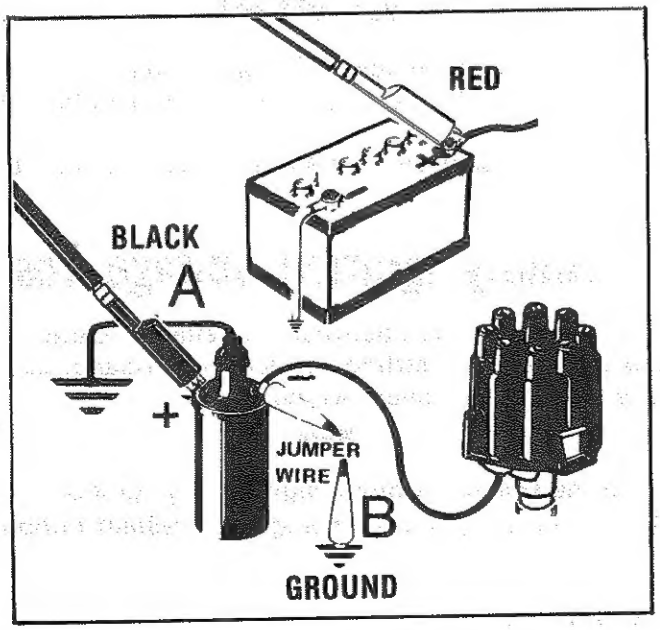


Figure 8. Two Ways to Disable a Standard Ignition System [A] Ground the Coil Secondary Cable [B] Ground the Coil Negative Terminal.

COMPONENT AND CIRCUIT TESTING

Ignition Switch Voltage Drop Test

This test is similar to the Primary Ignition Voltage Test, except that it tests the starting contacts in the ignition switch and the resistance by pass circuit that is used when the engine is being cranked.

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Knob to DC VOLTS.
3. Connect Jumper Wire and Red and Black test clips as shown in figure 8. To disable Eelctronic Ignition systems, see General Information section.

Note

On V-6 and V-8 High Energy ignition connect black clip to distributor BAT terminal, turn ignition ON and read volts.

4. With ignition switch no and engine cranking, read volts.

Test Results

Normal A reading below 1 volt indicates the primary resistor is being properly bypassed during cranking.

Note

A 6-volt system should also be within this specification.

High reading above 1 volt indicates excessive resistance or an open in bypass circuit. Check for loose or corroded connections.

Note

Some engines have a ballast resistor wire that is operational during both cranking and running. For these, a reading above 1 volt would be normal.

Cranking Voltage Test

The test procedure consists of cranking the engine while observing the display for cranking voltage, which indicates the condition of the battery, wiring, ignition switch, starter and engine.

1. Switch Analyzer to POWER ON.
2. Rotate Selector Knob to D.C. VOLTS.
3. Connect Red test clip to positive (+) battery post and Black test clip to negative (—) battery post as shown in figure 9.
4. Connect Jumper Wire between negative (—) coil terminal and a good ground on the engine to prevent the engine from starting while cranking. See figure 9.

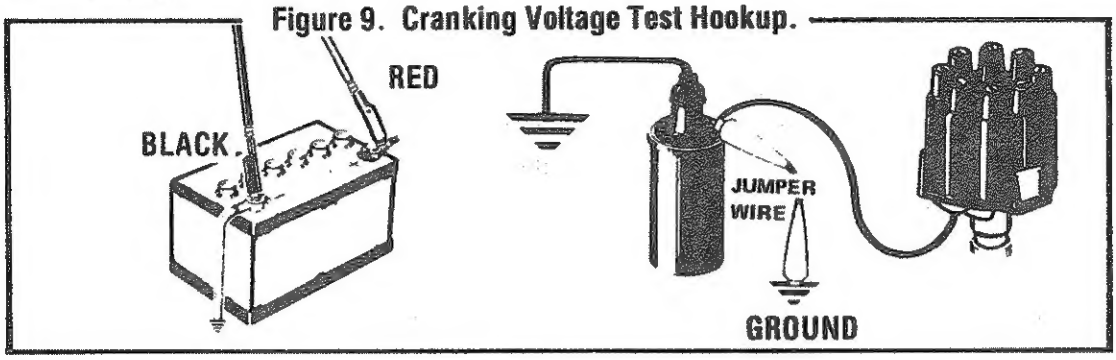
COMPONENT AND CIRCUIT TESTING

Note

To disable transistorized ignition systems, see General Information section.

5. With the ignition switch ON, crank the engine for approximately 5 seconds. Read volts while engine is cranking.

Figure 9. Cranking Voltage Test Hookup.



Test Results

A reading below 9.0 volts on a 12-volt system is too low. Check for:

1. Weak battery.
2. Defective battery cables.
3. Loose or corroded connections.
4. Defective ignition switch or starter.
5. Excessive engine drag.

Note

On 6-volt systems, a reading higher than 4.8 volts indicates a good battery and starter system.

Charging Voltage Test

This test is designed to determine the condition of the charging system.

Note

Test vehicle battery must be fully charged when performing this test.

1. Rotate Test Selector Knob to DC VOLTS.
2. Connect Red test clip to positive (+) battery terminal and Black test clip to negative (—) battery terminal (figure 10).
3. Operate engine at approximately 1500 RPM and read volts

COMPONENT AND CIRCUIT TESTING

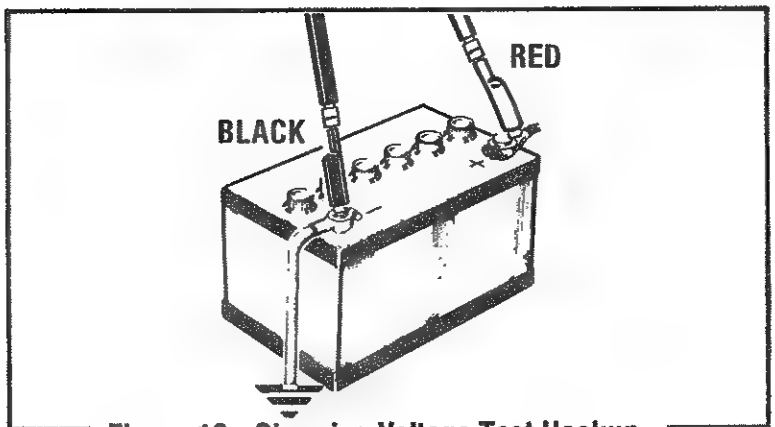


Figure 10. Charging Voltage Test Hookup.

Test Results

Normal reading should be between 13.8 and 15.4 volts. For 6-volt systems, reading should be between 7.0 and 7.6 volts.

Low

Check for:

1. Loose fan belt.
2. Low voltage regulator setting.
3. Defective voltage regulator.
4. Defective alternator diodes.
5. Defective alternator or generator.
6. Open field circuit.
7. Loose or corroded connections.

High

Check for:

1. High voltage regulator setting.
2. Defective voltage regulator.
3. Improperly grounded regulator.
4. Grounded or shorted generator circuit (generator systems only).

ANALYZER RESISTANCE TESTS

Resistance tests are measured in ohms, and are performed using the Red and Black test probes with the Selector Knob in LO OHMS or one of the four HI OHMS scales.

Note

The Liquid Crystal Display will always indicate an added resistance of approximately .1 to .3 ohms in the LOW OHMS resistance range. For best accuracy, short the red and black leads. Note the reading, and subtract it from the readings.

COMPONENT AND CIRCUIT TESTING

Circuit Continuity Testing

Continuity tests should be performed using the LO OHMS scale. The analyzer's extra long leads allow for checking continuity on anything from a light bulb to circuit wiring. Continuity readings should always be near zero ohms. Before condemning a circuit because of poor continuity, check all series connectors for proper connection.

Diode Testing

A diode is a device which permits current to flow in only one direction. Diodes can be tested by checking for continuity (in only one direction). The LO OHMS position in this Analyzer is specifically designed to check diodes, as follows:

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector to LO OHMS.
3. With the diode out of circuit touch one test probe to one diode lead and the other test probe to the other lead.
4. Read ohms on display.
5. Reverse the test probes and again note ohms reading. See Figure II.

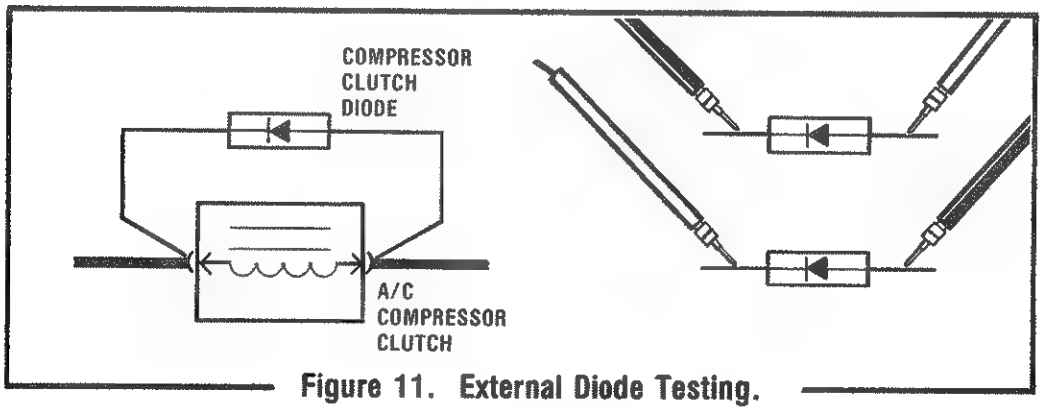


Figure 11. External Diode Testing.

Test Results

a. A good diode will read "1" in one direction and an ohms reading in the other.
b. DIODE SHORTED—Same low resistance reading in both directions.
c. DIODE OPEN—A "1" indicated in the left digit position on display in both directions.

COMPONENT AND CIRCUIT TESTING

Solenoid
Integral Diode Test

This test is used to check the coil and protection diode which are internal to some solenoids and relay coil assemblies. Typical examples include the Torque Converter Clutch Solenoid (TCC), Exhaust Gas Recirculation Solenoid Valve (EGR), and the Choke Heater Relay. See Figure 12. Failure of a protection diode (open) can cause transients to the Test Vehicle's System Computer causing the Computer to appear defective. A shorted protection diode can make the System Computer burn out or fail.

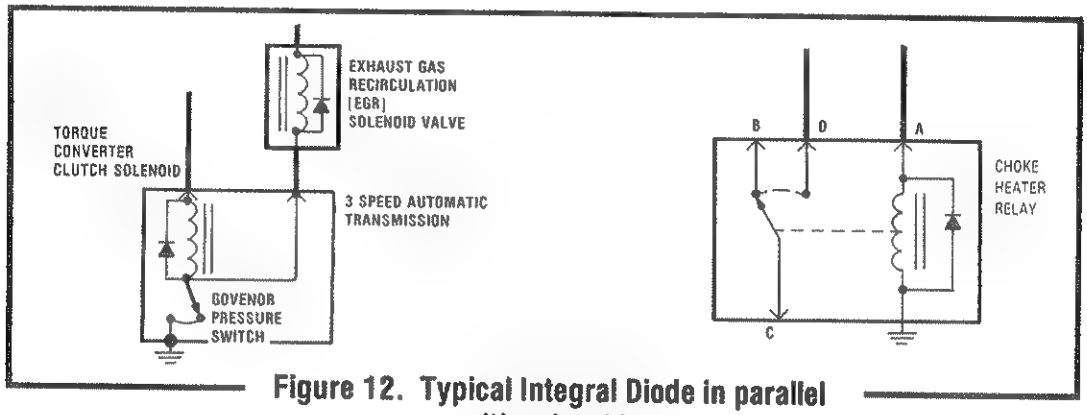


Figure 12. Typical Integral Diode in parallel with solenoid.

The LO OHMS position in this Analyzer is specifically designed to check diodes in parallel with a coil or solenoid, as follows:

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector to LO OHMS.
3. Touch the positive (Red) test probe to the positive solenoid lead and the negative (Black) test probe to the negative solenoid lead.
4. Read Ohms on display.

Test Results

a. Reading 20-40 ohms - Diode or coil is not shorted. Go to step #5.

b. Reading 0 ohms - Diode or coil is shorted. Replace assembly.

5. Reverse the test probes on the solenoid.
6. Read Ohms on display.

Test Results

a. Reading is lower than in step step #4. (usually 1-10 ohms lower.) -Diode and coil are O.K.

b. Reading is same as in step #4 - Diode is open. Replace assembly.

COMPONENT AND CIRCUIT TESTING

Alternator Rotor Test

This test provides methods for determining the condition of the rotor.

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Knob to LO OHMS.
3. With alternator removed from vehicle and disassembled, touch test probes to the two slip rings on the alternator shaft as shown in figure 13A.
4. Read ohms on display. *See Test Result A, below.*
5. Touch one test probe to either slip ring and the other test probe to the alternator rotor shaft as shown in figure 13B.
6. Read ohms on display. *See Test Result B below.*

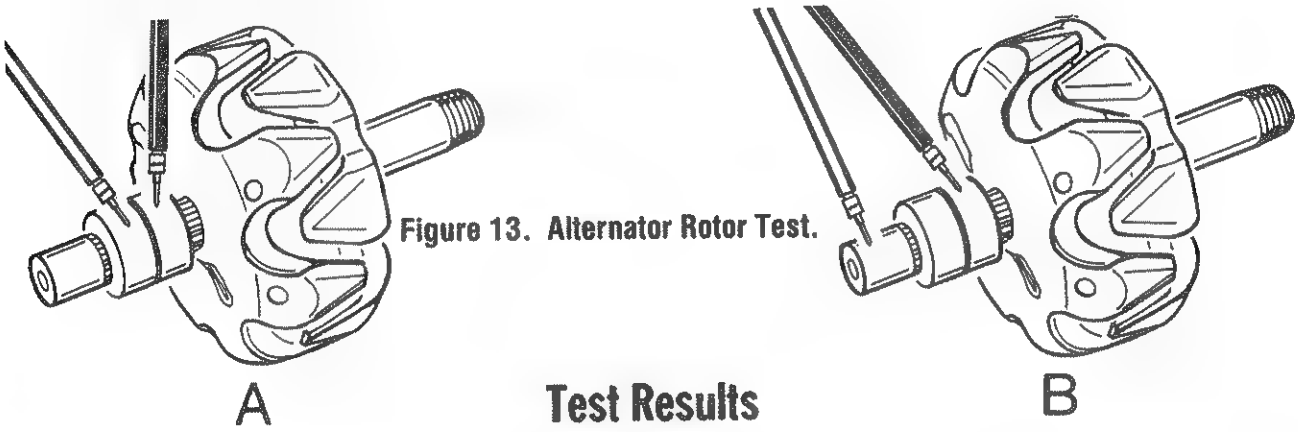


Figure 13. Alternator Rotor Test.

Test Results

A. Ohmmeter reading should meet vehicle manufacturer's specifications (generally between 4 and 6 ohms). If reading is infinite or substantially above manufacturer's specifications, alternator rotor is defective.

B. Ohmmeter reading should be overrange. The digit "1" should appear on the display. If reading is anything less than infinite, the alternator rotor is grounded.

Stator Bench Test

The condition of the stator windings is determined by the following test.

1. Switch Analyzer to POWER ON.
2. Rotate Selector Knob to LO OHMS. (Check manufacturer's specifications to find proper ohms range setting.)
3. Remove stator and disconnect three stator lead connectors.
4. Connect one lead to stator connector. Touch second lead to other stator connectors in sequence (figure 14).
5. Reconnect lead to second stator connector and touch other lead to third connector.
6. Check manufacturer's specifications for proper ohms reading. All readings on the three stator leads should be similar.

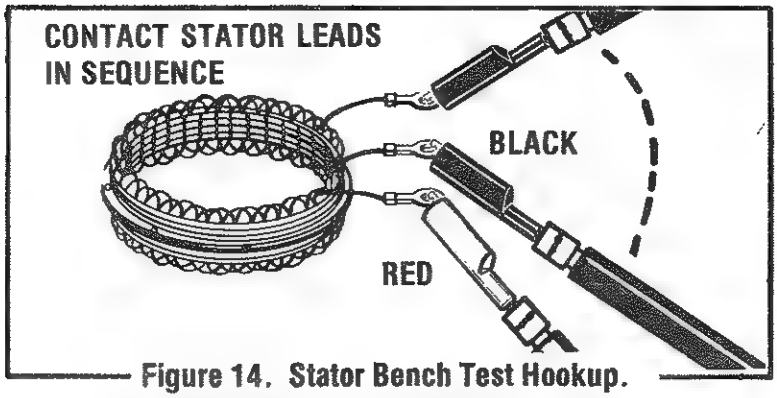


Figure 14. Stator Bench Test Hookup.

Alternator Diode Test

This test is used to detect a defective diode and to determine what condition has made it defective.

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Knob to HI OHMS.
3. Rotate HI OHMS Selector Knob to 200K Ohms.
4. With alternator disassembled, remove the stator leads from the diodes. Separate the diode leads so tests can be made on each individual diode.
5. Touch one test probe to ground on the diode casing and the other test probe on the diode lead as illustrated in figure 15.
6. Read ohms on display.
7. Reverse the test probes and again note ohms reading.

Note

On many late model vehicles, all diodes are cast into a single heat sink. Refer to vehicle manufacturer's service manual for specific test procedures.

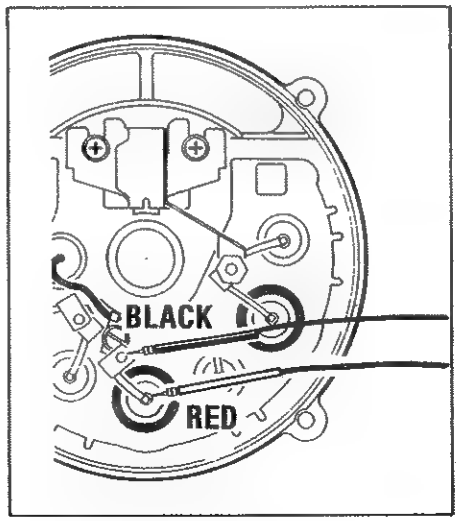


Figure 15. Alternator Diode Test Hookup.

Test Results

a. A good diode will read "1" in one direction and an ohms reading in the other.
b. DIODE SHORTED—Same low resistance reading in both directions.
c. DIODE OPEN—A "1" indicated in the left digit position on display in both directions.

COMPONENT AND CIRCUIT TESTING

Diode Trio Test

Step A

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Knob to HI OHMS.
3. Rotate HI OHMS Selector to 200K ohms.
4. Connect Red test lead to the ground strap of the diode trio as shown in figure 16.
5. Touch the remaining test probe to each of the three diode trio connectors in sequence and note readings.

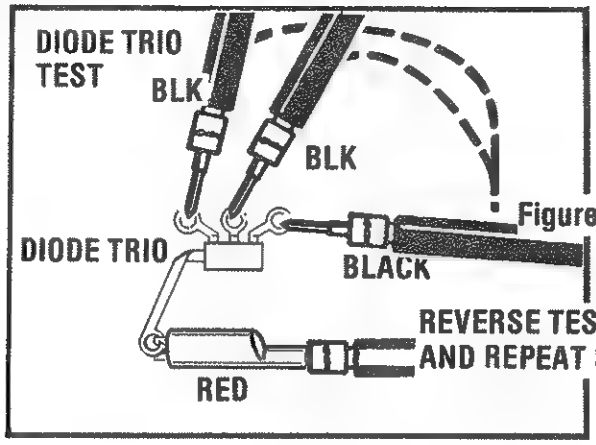


Figure 16. Diode Trio Test Hookup.

Step B

Reverse test leads and repeat the same procedure outlined in Step A. Note readings.

Test Results

All readings should be the same and in sequence for each Step. In Step A, the three readings should indicate infinity. In Step B, readings should indicate uniform continuity. If readings are not uniform, replace the diode trio.

Ignition Coil Ground Test

This test determines if the primary winding of the coil is grounded to the case.

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Knob to HI OHMS.
3. Rotate HI OHMS Selector Knob to 200K ohms.
4. Disconnect both primary wires from the ignition coil.
5. Touch one test probe to either coil primary terminal and the other test probe to ground on the coil case, as illustrated in figure 17.
6. Read ohms on display.

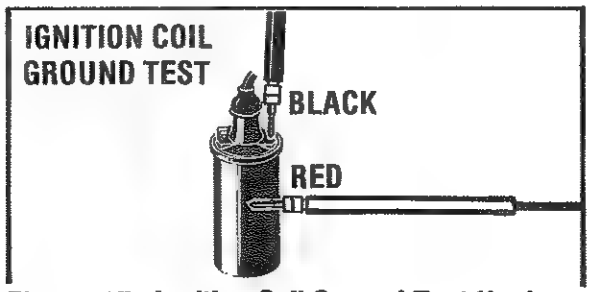


Figure 17. Ignition Coil Ground Test Hookup.

COMPONENT AND CIRCUIT TESTING

Test Results

Reading should be overrange (a digit "1" will appear). Any reading of resistance indicates a grounded coil winding.

Ballast Resistor Condition

The condition of the ballast resistor is determined by the following test.

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Switch to LO OHMS.
3. Touch Red and Black test probes to each end of the ballast resistor. To test Chrysler Dual Ballast Resistor, make connection with Red and Black test probes at each side and note readings. See Figure 18.
4. Read ohms on display.
5. Reading should be 2.2 ohms generally (See manufacturer's specifications). If ballast resistor is open reading will be "1" (overrange).

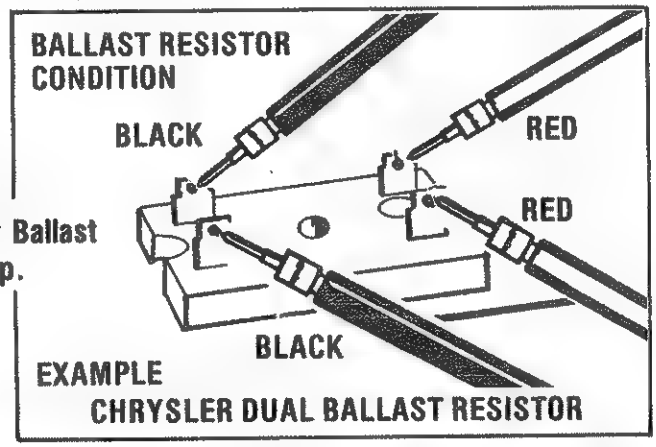


Figure 18. Chrysler Ballast Resistor Test Hookup.

Ignition Coil Primary Winding Test

This test is used to determine the condition of the coil's primary winding.

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Switch to LO OHMS.
3. Remove primary coil wires from positive (+) and negative (—) coil terminals.
4. Touch test probes to Positive (+) and negative (—) coil terminals (figure 19).
5. Read ohms on display.

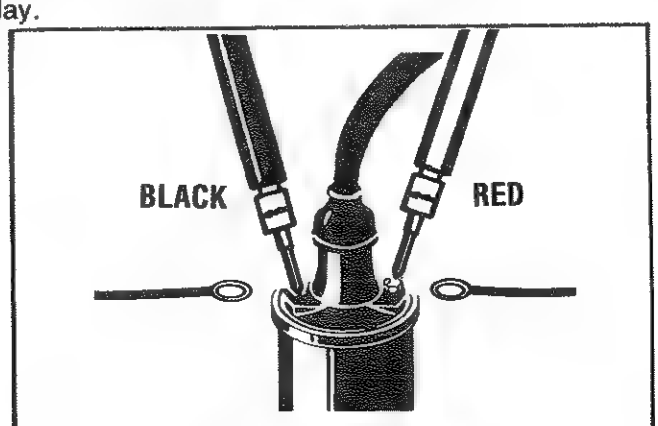


Figure 19. Coil Primary Winding Test Hookup.

COMPONENT AND CIRCUIT TESTING

Test Results

Ohmmeter reading should meet the vehicle manufacturer's specifications. Generally, coil primary winding resistance should be between 1 and 2 ohms.

If reading is substantially above or below manufacturer's specifications, the ignition coil is defective.

Ignition Coil Secondary Winding Test

This is a test to determine the condition of the coil secondary winding.

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Knob to HI OHMS.
3. Rotate HI OHMS Selector Knob to 200K ohms.
4. Disconnect both primary wires from the ignition coil and remove the secondary wire from the
4. ignition coil tower.
5. Touch one test probe to either coil primary terminal and the other test probe into the coil tower.
6. Read ohms on display.

Test Results

Ignition coil secondary winding resistance should meet vehicle manufacturer's specifications. The following are acceptable resistance ranges for domestic vehicles with non-transistorized ignition systems:

American Motors	3K-20K Ohms
Chrysler	9K-12K Ohms
Ford	7K-9K Ohms
General Motors	3K-20K Ohms

If reading is substantially above or below manufacturer's specifications, the ignition coil is defective.

Secondary Ignition Wire Test

Excessive resistance in the wires to the spark plugs can cause hard starting and poor performance of the engine. This test determines the resistance of the spark plug wires.

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Knob to HI OHMS.
3. Rotate HI OHMS Selector Knob to 200K ohms.
4. Remove the spark plug wire from spark plug and distributor cap tower.
5. Connect one test clip to each end of the spark plug wire, as shown in figure 20.
6. Read ohms on display screen.
7. Repeat test for all spark plug wires and high tension coil wire.

COMPONENT AND CIRCUIT TESTING

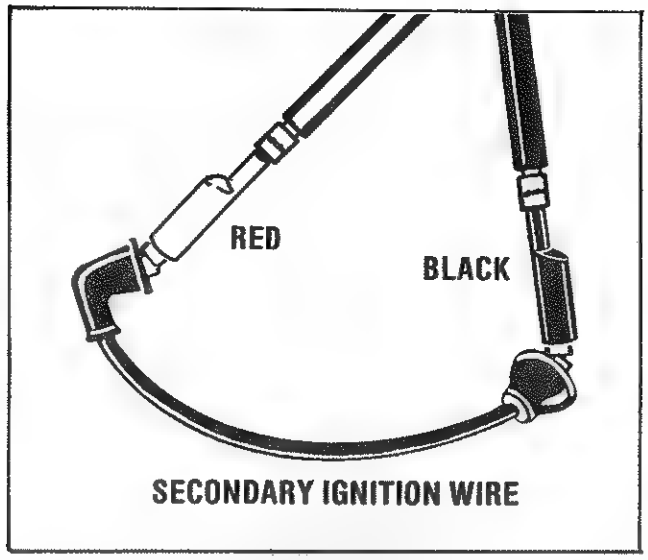


Figure 20. Secondary Ignition Wire Test Hookup.

Test Results

Secondary ignition wire resistance should meet vehicle manufacturer's specifications. *The following resistance ranges for spark plug wires are intended as a general guideline only.*

Infinite Resistance

A reading of infinity indicates a defective (open) wire.

High Resistance (20K-80K Ohms)

Wire may have excessive resistance. Check specifications.

Normal Resistance (0-20K Ohms)

TVRS (radio resistance wire.) The resistance reading will vary depending on the type and length of spark plug wire.

Zero Resistance

Indicates continuity in a metal strand ignition wire.

ANALYZER PICK-UP COIL TESTS

The magnetic pick-up coil located inside the distributor produces the electrical signal that activates the transistors in the electronic module. A pick-up coil that is not operating properly may be the cause of starting failure.

These procedures are for testing the magnetic pick-up coil in General Motors, Ford, Chrysler and import vehicles with electronic ignition systems.

COMPONENT AND CIRCUIT TESTING

General Motors HEI

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Knob to PICKUP OUTPUT.
3. Remove distributor cap and rotor. (If necessary for clearance on V-6 and V-8 engines, also remove distributor BAT lead and module connector at distributor cap.)
4. Remove the two wires from the pick-up coil side of the electronic module, and connect the Red and Black test leads to the wires as shown in figure 21.

Note

Do not allow clips to touch each other or ground.

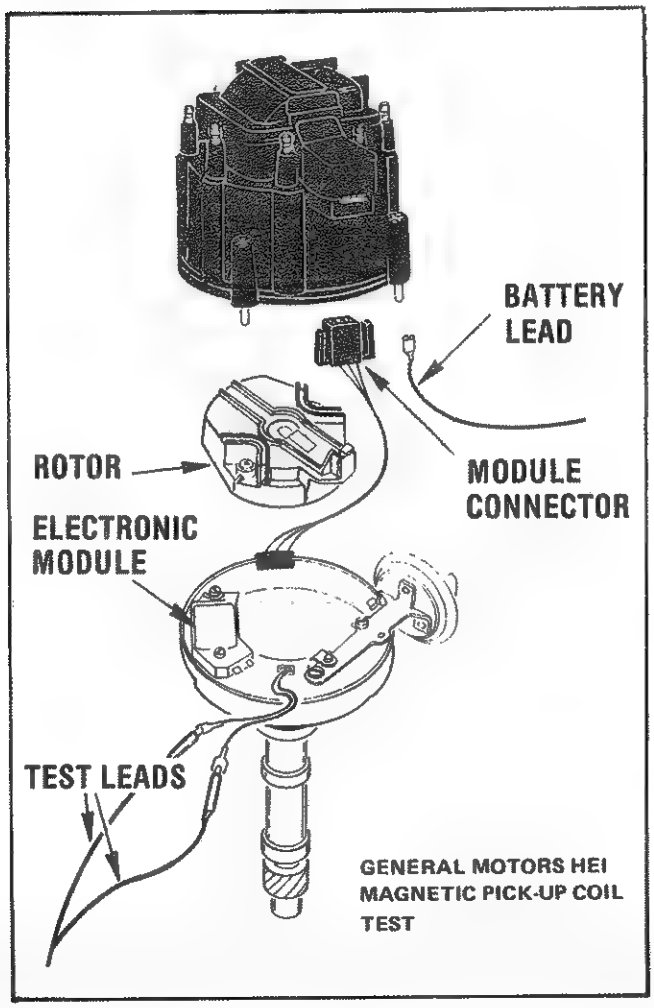


Figure 21. HEI Pick-Up Coil Test Hookup.

5. Crank engine for 10 seconds while observing digital display.
6. Display should read approximately 1.5 volts. Be sure test vehicle battery is fully charged for this test. If display reads considerably less than 1.5 volts and battery is well charged, the pick-up coil is suspect.
7. Remove test leads. Reconnect all wires and replace distributor cap and rotor.

COMPONENT AND CIRCUIT TESTING

Ford Transistorized Ignition

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Knob to PICKUP OUTPUT.
3. Disconnect three-wire connector between the distributor and electronic module. Connect the Red and Black test leads to the distributor side of the connector as shown in figure 22.
4. Crank engine for 10 seconds while observing digital display.
5. Display should read approximately 3.0 volts. Be sure test vehicle battery is fully charged for this test. If display reads considerably less than 3.0 volts and battery is well charged, the pickup coil if suspect.
6. Remove test leads and reconnect three-wire connector.

Note

Do not allow clips to touch each other or battery ground.

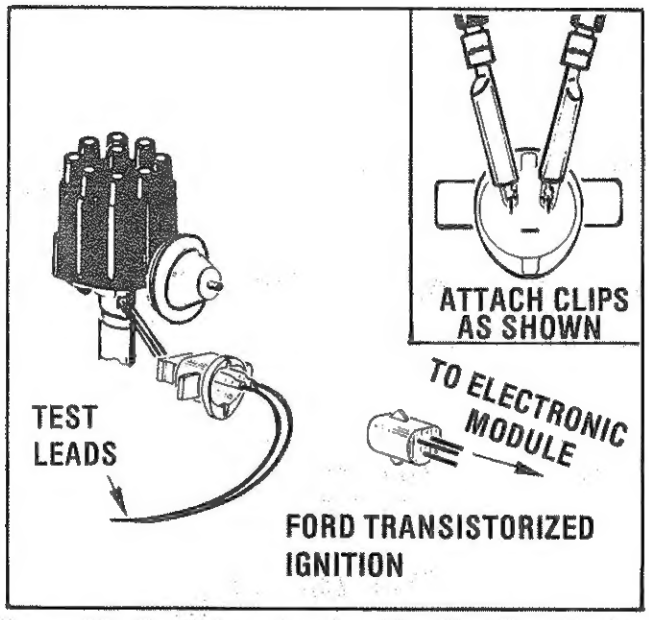


Figure 22. Ford Transistorized Ignition Test Hookup.

Chrysler Transistorized Ignition

1. Switch Analyzer to POWER ON.
2. Rotate Test Selector Knob to PICKUP OUTPUT.
3. Disconnect two-wire connector between the distributor and electronic module. Connect the Red and Black test leads to the distributor side of the connector as shown in figure 23.

Note

Do not allow clips to touch each other or battery ground.

4. Crank engine while observing display.
5. Display should read approximately 3.0 volts. Be sure test vehicle battery is fully charged for this test. If display reads considerably less than 3.0 volts and battery is well charged, the pickup coil is suspect.
6. Remove test leads and reconnect two-wire connector.

COMPONENT AND CIRCUIT TESTING

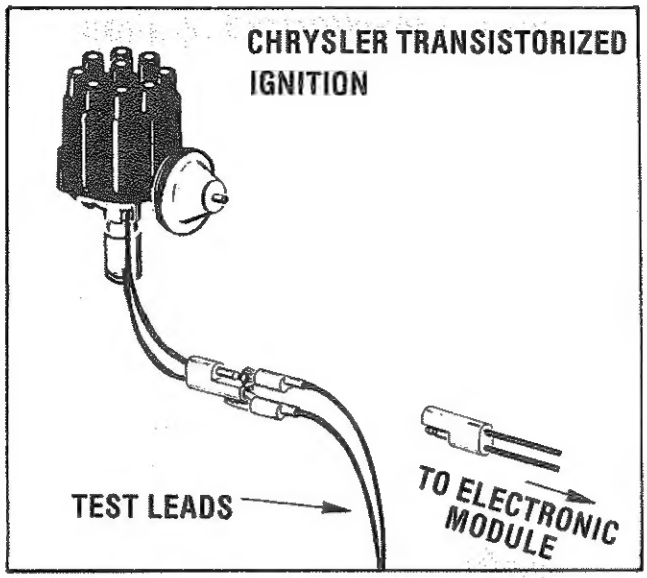


Figure 23. Chrysler Transistorized Ignition Test Hookup.

Testing Import Vehicles With Electronic Ignition

Most late model import vehilces equipped with electronic ignition utilize magnetic sensor coils similar to those used domestically.

Before troubleshooting an import vehicle, check the vehicle manufacturer's specifications to determine the type of distributor coil pick-up used. Refer to the appropriate section of the manual, especially if a "Hall-Effect" type distributor sensor is used.

Pick-Up Test

1. Identify the coil pick-up leads at the distributor. Remove the distributor cap for greater accessability, if necessary.
2. Unplug the coil pick-up to the harness connector and identify the pick-up ground lead. (Check manufacturer's specifications for color-coding.)
3. Connect Red and Balck test leads to the two remaining leads of the coil pick-up harness connector. Rotate the Test Selector Knob to the PICKUP OUTPUT position. (Pick-up ground lead is not used for this test.)
4. Crank engine and observe display. Be sure test vehicle battery is fully charged for this test. Refer to manufacturer's specifications for proper pickup output.

Notes On Testing Import Vehicles

— Refer to the vehicle manufacturer's diagrams and specifications to identify the ballast resistor or resistor wire (if used). Select either volts or an ohms position to test the ballast resistor or resistor wire.

— Voltage source and ignition switch test are performed in the same manner as domestic vehicles.

— Rotate Test Selector Switch to an ohms position to check the secondary ignition coil for proper resistance.

MAINTENANCE

BATTERY REPLACEMENT

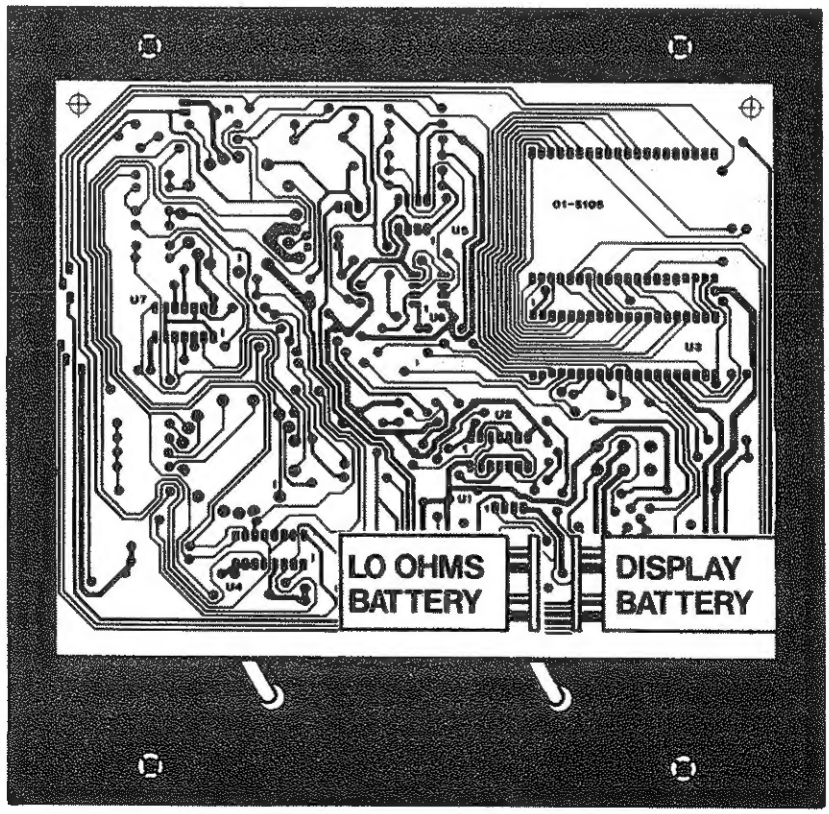
The Components Analyzer is powered by two 9V batteries. If either of the batteries runs down a LO BAT indication will be displayed on the digital display.

To check for a bad Display Battery, turn on the Components Analyzer and place the test selector in the D.C. Volts, Pickup Output, or HI Ohms position. If LO BAT appears, replace the Display Battery.

To check for a bad LO Ohms Battery, turn on the Components Analyzer and place the test selector in the LO OHMS position. If LO BAT appears, replace the LO Ohms Battery.

Replace batteries by removing the Components Analyzer Module (4 latches). Release the module latches by pulling on the small black plunger knobs. The plunger knobs will "pop out" about ¼". When all the knobs for the module are "popped out" the latches are released and the module can simply be lifted out of the case.

The batteries are found on the back of the circuit board.



Components Module [Rear View]

CLEANING THE COMPONENTS ANALYZER

The Components Analyzer can keep its new appearance if it is cleaned regularly with a soft cloth and warm soapy water. CAUTION: Do not use degreasers or strong solvents.

MAINTENANCE

TECHNICAL SERVICE INFORMATION

Call Toll Free for instant answers to:

1. Factory Specifications for approved Tune-Up.
2. Technical help for trouble-shooting Tune-Up problems.
3. Proper use and hook-up of the instrument.
4. Latest data on Emission Control maintenance and service.
5. A personal contact with the factory should the tester need repair or calibration.

Just dial 800-253-9880* Toll Free anytime between 7:30 A.M. and 5:00 P.M. Eastern Time Monday thru Friday. Ask for the Technical Service Manager and tell him the problem.

*Michigan - call 800-632-5090

FACTORY SERVICE ...

If the occasion arises whereby the analyzer requires service, the following details are listed with the intention they will be used as a guide to help expedite service.

1. Always list the Model and Serial number. Attach a note to the unit with a brief message listing the problem(s).

2. PACKAGING FOR SHIPMENT - Packing the analyzer so it will arrive at its destination without shipping damage is important.
   A. Shipping damage may cause a delay in the return of the unit as well as the added expense.
   B. Shipping damage is claimed in two categories:
      1. Visual Carton Damage: This type of claim is made with the carrier.
      2. Concealed Damage: This type must be referred to the sender.

GOOD PACKING WILL AVOID SHIPPING DAMAGE AND ADDED EXPENSE.